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ABSTRACT

The purpose of this study was to examine the operations of a Texas high-poverty middle school focusing on teachers as a significant component in the flow of resources and their effect on achievement. The sample in this study included 11 math teachers and 26 English/language arts teachers, all from the same school, along with randomly selected sample of even numbered at-risk and non-at-risk students for sixth, seventh, and eighth grade. The results indicate that students' math achievement was not significantly affected by teacher preparation, and there was no difference between the two categories of students regarding student achievement. The study results suggest that teachers' knowledge, skill level, caring, commitment to student learning, and the school's organizational capacity were incongruent with the needs of high-poverty students. The reason is that serious misalignments produce marginal productivity. Misalignment is the result of a mismatch between the resource and the learner. The findings also indicate the need for more comprehensive microlevel studies that measure the unique characteristics, preparation, development, allocation, and actual use of teacher resources. Contains 56 references. (RJM)

School Productivity: Teachers as Resources

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by

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School Productivity: Teachers as Resources

The effect of money upon student achievement or school productivity is a hotly debated issue. Although intuition suggests that increased resources will increase performance and several studies have reported significant relationships among teacher quality, class size, or per pupil cost and achievement, others have reported that money has minimal or no effect on school achievement (Armour-Thomas, 1989; Coleman, 1966; Darling-Hammond, 1996; Ferguson, 1991; Greenwald, Hedges, & Laine, 1996; Hanushek, 1986; Hanushek, 1995; Hedges, Laine, & Greenwald, 1994; Krueger, 1996; Monk, 1994; Monk, 1996; Mosteller, 1995). The purpose of this study was to examine the operations of a Texas high-poverty middle school, focusing on teachers as a significant component in the flow of resources and their effect on student achievement.

Historically, school productivity studies have focused on macro analyses utilizing production function theory and methods to assess the direction and magnitude of the relationship between a variety of school inputs and student achievement (Coleman, 1966; Ferguson, 1991; Greenwald, Hedges, & Laine, 1996; Hanushek, 1986; Hedges, Laine, & Greenwald, 1994). While these studies have been invaluable they have produced little information on the school productivity process in high-poverty schools. With almost 25 percent of the children in the United States living in poverty, there is a need to understand and to improve school productivity in high-poverty schools (Bennett, 1995; Monk, 1994; Odden & Clune, 1995; Rossmiller, 1986; U. S. Senate, 1996; Wainer, 1993).

School productivity studies have focused on the resource allocation and utilization processes, examining human and material resources subject to administrative allocation decisions and student time allocation decisions.

Human resources include teachers, students, and parents. Material resources are supplies, materials, computers, facilities, programs, and activities. Resources are intended to produce outcomes that can be long term outcomes like productive employment or success in college, or short term achievement or changes in behavior. According to recent theory, resources' maximum transformational powers are realized under the most favorable conditions (Monk, 1994, 1996). Maximum productivity is achieved when the resource is prepared, aligned, and used for its intended purpose with intended learners. For example, high school junior students, assigned to teachers who have taken nine or more undergraduate courses in math, reported higher performance levels than students who were students of teachers with fewer preparation courses. Teachers best prepared to teach math to ninth grade students achieve maximum productivity when assigned or matched with the intended group of students. Maximum productivity is also affected by other more complex factors, like teacher tenure, types of students, and types of subject assignments. Moreover, the clearer the definitions of transitions and alignments, the better the match (Monk, 1996).

Serious misalignments produce marginal productivity. Misalignment is the result of a mismatch between the resource and the learner, with some mismatch considered. For example, the teacher should have knowledge that the learner does not have. An exception to misalignment is the highly competent teacher who successfully completes any assignment regardless of alignment (Monk, 1994, 1996). Resource alignment during the allocation process, particularly in high-poverty and high-minority student environments, is a complex process that lends itself to the exploratory case study method. The case study method allows for

exploration of the unknown. Is content alignment enough? Should teachers also possess skills and knowledge associated with student background characteristics? How many courses of which teacher preparation classes should a teacher resource have to possess the skills and knowledge to be a good match (alignment) with the learning needs of linguistically different, immigrant, and other low-income student resources? How is resource alignment defined in high-poverty schools? Monk contends that the types of students with which a teacher is working also affect maximum productivity (1994, Monk).

According to the literature, teachers, the single most important determinant of student achievement, should possess knowledge and skills beyond content knowledge (Armour-Thomas, 1989; Darling-Hammond, 1996; and Ferguson, 1991). The needs of diverse students call for dramatic improvements in teacher preparation as a life-long learning process, including developing caring teachers with ethical, cultural, and socio-linguistic knowledge and awareness. Teachers of diverse student groups need to have a more complex view of students and new conceptions of intelligence, student assessment, and student motivation. There is a need to develop sophisticated pedagogical content knowledge that will enable teachers to connect with and challenge their students' prior learning, including socio-linguistic and cognitive organization consistent with cultural experiences and motivational patterns (Ashton, 1996; Clandinin & Connelly, 1996; Cohen, McLaughlin, & Talbert, 1993; Darling-Hammond & Sclan, 1996; Darling-Hammond, 1996a; Darling-Hammond, 1996b; Darling-Hammond, 1992; Delpit, 1995; Ladson-Billings, 1995; Little, 1982; Lopez, 1995; Purkey & Smith, 1983; Reyes, 1997; Rosenholtz, 1985; Sikula, Battery,

& Guyton, 1996; Smith and O'Day, 1989; Stanfield, 1985; Sykes, 1996; Tatto, 1996; and Tharpe, 1988).

While the literature asserts the significance of teachers as resources, it also stresses the importance of how teacher resources are intertwined into the schools' organizational capacity and commitment to student learning as equally important (Newmann, 1997). Commitment to student learning refers to teacher efficacy, the expectation that students will learn, and the willingness to put forth the effort required for student learning, regardless of their academic difficulties or social backgrounds (Ashton & Webb, 1986, Kushman, 1992; Levin, 1987; Riehl & Sipple, 1996; Rosenholtz, 1989).

While the literature proposes that teachers working with high-poverty students possess knowledge and skills beyond content knowledge, the practice shows the assignment of less prepared and lower paid teachers to high-poverty schools. Inexperienced teachers, teachers with alternative certification, teachers with teaching permits, teachers who are not certified in the assigned subject, and substitute teachers, often without a college degree, are more often assigned to teach in schools with low-income children (Lippman, Burns, and Mc Arthur, 1996). In 1991, about 33 percent of the new teachers assigned to teach mathematics, science, social studies, and special education were ineligible for certification in those fields, but children in urban schools only had a 50 percent chance of being taught by a certified math or science teacher. According to Lippman (1996), "Students at public secondary schools with a high poverty level (more than 40 percent eligible for free or reduced-price lunch) were less likely to be taught any of the core subjects by a teacher who majored in that subject than were students at public secondary schools with a low poverty level (5 percent or less eligible for free or reduced-priced lunch.)"

In Texas, according to Public Education Information Management System (PEIMS) (1996), 39.5 percent of all the English Language Arts teachers and 49.9 percent of all the mathematics teachers were not certified. The PEIMS data included alternative certification teachers in the certified category. In some states, law limits alternative certification to bilingual education, English-as-a-second language, and special education, targeting programs and districts with high-minority student enrollment (Ashton, 1996; Cole, 1995; Darling-Hammond & Sclan, 1996; Darling-Hammon, 1992; Hill, 1993; Reyes, 1996; Stoddard and Floden, 1995).

While alternative certification programs may offer opportunities for mature and subject matter experts who choose to work with low-income and minority students and are more likely to reduce teacher turnover, there are many quality concerns. Problems include quality of the preparation program, quality of selection criteria, quality of candidate's academic qualifications, and quality of candidate assignment(Shen, 1997). Some research shows that teachers with alternative certification have problems with instruction, anticipating student difficulties in learning subject matter, have low expectations of minority and low income students, have misconceptions about the nature of learning, and effective teaching (Ashton, 1996; McDiarmid & Wilson, 1991; Monk, 1994; and Shulman, 1987). While there are arguments against alternative certification, the reality exists that traditional teacher certification programs may not be meeting the needs of poor and minority students. An analysis related to teacher certification for a Texas fourth grade teacher cohort indicated that there was no difference in NAPT student performance between certified teachers and non-certified teachers (Lopez, 1995). In reality, neither

traditionally nor alternative certification teachers are prepared to meet the challenges of teaching in the most needy schools (Zumwalt, 1996).

According to the review of the literature, while the effect of money on student achievement continues to be a highly debated issue, it is clear that money and how school administrators use money does make a difference. Teachers as resources and the alignment of teachers with student resources are some of the most important components in the resource allocation process. While the research provides compelling evidence of the effectiveness of teacher preparation programs, dramatic improvements are needed to meet the complex needs of students from a variety of ethnic and income groups in difficult school and community conditions. When scarce resources have poor preparation or are misaligned in the resource allocation process, more money may not make a difference.

Methodology

Data Collection and Sample

Quantitative and qualitative data were gathered using a case study approach. Quantitative data gathered included teacher assignments, teacher certification, teachers' student assignments, and student at-risk and non at-risk categories. Quantitative data were gathered from the school, the district's research office and finance office, and the state education office. Quantitative data were analyzed using descriptive statistics and analyses of variances. Quantitative data analysis were expanded using interviews with school administrators, staff, four teacher researchers and former teachers.

A middle school was used because for poor children, middle schools pose "make or break" educational transitions that have academic, developmental, organizational, and social implications for which there is

an absence of research (Clune, 1995; Monk, 1994; Wigfield & Eccles, 1994.) A focus on Hispanic students was selected because of the abysmal educational conditions of Hispanics including a high school completion rate of 50.8 percent, which is 30 percent less than that of non-Hispanics (Ronda & Valencia, 1994; Frase, 1992.). Given the absence of model finance studies in high-poverty middle schools, the case study method provided a process to explore a new area of research.

A nonprobabilistic purposeful samplying strategy was used to select the sample school. The school was selected because it was located in a high-poverty urban environment, was categorized as low performing based on the state's accountability system, and was willing to participate on a voluntary basis. The school provided the ideal environment to discover, understand, and gain insights into the flow of resources in a high-poverty middle school.

A stratified randomly selected student sample with equal numbers for sixth, seventh, and eighth grade at-risk and regular students was used. Data were gathered for 75 at-risk and 75 regular education students, 25 sixth grade regular education students, 25 sixth grade at-risk students, 25 seventh grade regular education students, 25 seventh grade at-risk students, 25 eighth grade regular education students, and 25 eighth grade at-risk students. The original student sample consisted of 150 students; however, not all the sample had complete reading and math test scores. Reading data were gathered for 127 students, 67 at-risk and 60 non at-risk or regular students. Math data were gathered for 144 students, 73 at-risk and 71 non at-risk or regular students. Some students were missing scores for a number of reasons, including exemptions for bilingual students and absence from school on the test day. The teacher sample consisted of eleven

math teachers and 26 English/language arts teachers from a faculty of 75 teachers.

Teacher Data

Teacher data included salaries, teacher tenure, teacher certification, staff development, subjects taught, and students taught. A teachers survey provided teacher background characteristics. Teacher preparation data was organized in the following six preparation categories: (1) certification unknown; (2) permit; (3) certified in a field different from the assigned teaching subject; (4) long-term substitute teacher with no certification; (5) alternative certification; and (6) certified in the assigned teaching field.

For purposes of this study teacher preparation categories were refined to reflect a more clear background of the teachers' actual preparation investment and intended use for maximum transformation (Monk, 1994, 1995). Teachers with certification in the assigned teaching field were regarded as prepared, aligned, and used for intended purposes with intended learners to achieve maximum productivity (Monk, 1994, 1996). Teachers with alternative certification were considered to have a lower preparation investment and presented some misalignment between resource preparation and intended use with intended learners (Monk, 1994, 1996). Teachers with certification in an area other than the assigned teaching area, teachers with permits, and long term substitutes were considered, theoretically, to have the greatest degree of misalignment and projected to produce lower achievement. These data were only available on the campus level using qualitative research methods. Interviews were conducted with school personnel to refine incomplete central office and state agency data.

Student Data

Achievement data for the total campus was gathered from the state education agency and the school district. The school provided the master schedule for teachers and the district research office provided student class schedules, Texas Assessment of Academic Skills (TAAS) data for math and reading, and risk factors. The school provided math and reading grades for the student sample.

Math and reading end-of-semester grades and TAAS scores were gathered for the total student population and for the student sample. TAAS scores were gathered using normal curve equivalence (nce) scores for math and reading. NCE relates to a students' statewide performance using a bell curve and do not allow a direct comparison to national performance. Minimum expectation for passing the TAAS is 70 percent of the items correct. Student sample achievement, including math and reading grades and math and reading TAAS scores were matched with teacher certification data.

At-risk students were identified by the state if they exhibited one of six state-mandated variables, including failing one subtest from the Texas Assessment of Academic Skills, failing grades in one subject, failing a grade, too many absences, overage, limited English proficiency, and special education (*Texas Education Code,* 1996).

Background Data

This study was conducted in a Southwestern urban, high-poverty middle school using 1994-95 data. Of the 1,397 enrollment, 73 percent were low income, 86 percent were at risk, 54 percent were female, and 97 percent were Hispanic. While 34 percent of the students were classified as eligible for English-as-a-second-language, a school administrator confirmed that over 60 percent of the students were linguistically different; however, the

school did not have a bilingual education program. Parent data indicated that over 50 percent of the parents were born in Mexico or El Salavador. The local Presbyterian church was a designated santuary for refugees. Teacher tenure data showed that over 50 percent of the math and reading teachers had less than four years of experience. Teacher certification data indicated that only 55 percent of the assigned teachers were certified in the assigned subject. The remaining teachers were certified in another subject, were alternatively certified, were long-term substitutes, or were using teaching permits. Interviews with the teachers, administrators, and staff indicated that teachers tended to leave for better schools, to seek a more supportive environment, and for family reasons. One teacher was terminated for poor performance. An interview with a former teacher indicated that younger teachers felt excluded from the governance process. Older teachers, as members of the site-based decision making council, tended to make decisions that maintained a status quo. In the summer of 1995, the sample school was given a state accreditation warning for poor performance. The school improvement plan focused on short term goals to improve test scores.

Problems and Limitations

The data gathering was a complex process that was complicated by campus data availability and incompatibility between campus-based data and district and state databases. No data were available on long term substitutes. Substitutes made up 15 percent of the faculty. Substitute mobility was evident in one class that had four different teachers in one school year. The district certification data were more current than the state education agency data. District data categorized teachers by primary and secondary teaching fields, permits, and alternative certification. The state

categorizes all teachers as certified regardless of whether they have full certification, alternative certification, certification in another subject, or secondary certification. Databases that were available were incompatible with each other. For example, state teacher certification data is collected in October and do not reflect school year campus-based changes, including high teacher turnover. There were no databases at the campus level or the state level that connected teacher certification data to student achievement. Individual student achievement data were only available after school was dismissed for the school year and teachers were given new students. Student grades were available in hard copy for the previous year. No individual student TAAS data were available to calculate individual student growth. While small scale studies can provide rich campus-based data, they can also show the limitations.

A final limitation was that the sample was too small to make generalizations beyond the case campus; however, assumptions can be made about campuses with similar demographics.

Research Question

The purpose of this study was to examine the operations of a high-poverty middle school, focusing on teachers as a significant component in the flow of resources and their effect on achievement. The research question, "Does money make a difference in education?" was derived from the theoretical research and revised to reflect the case study approach. The study attempted to answer the following question: "How do teachers as resources in the resource utilization process affect achievement for at-risk students and regular students in a high-poverty middle school?"

Findings

How do teachers, as resources in the school productivity debate, affect achievement for at-risk and regular education students in a high-poverty middle school? Study findings were reported as follows: (1) distribution of math and reading students by teacher preparation category; (2) TAAS NCE math and reading score differences by teacher preparation category; (3) final semester math and reading grade differences by teacher preparation category; (4) math and reading differences between NCE scores and end-of-semester grades by teacher preparation category to measure grade inflation; (5) math and reading student assignment by teacher preparation category of at-risk and non at-risk students; (6) math and reading by gender; (7) math NCE score differences of at-risk and non at-risk students by teacher preparation category; (8) reading NCE score differences of at-risk and non at-risk students by teacher preparation category; and (9) math and reading grade differences of at-risk and non at-risk students by teacher preparation category.

Achievement Differences on Normal curveEquivalence (NCE) for Math and Reading Scores

Distribution of Math Students by Teacher Preparation

Student achievement differences for math and reading data were examined using NCE scores for each teacher preparation category. (See Table 1.) Of the total sample of math students (N=144), 104 students were assigned to teachers with full math certification. Of these 104 students, 16 percent scored less than the 50th percentile, 70 percent scored between the 50th and 74th percentile, and 14 percent scored between the 75th and 99th percentile on the math section of the Texas Assessment of Academic Skills (TAAS).

Table 1 about here

Twenty-one students were assigned to teachers with alternative certification in math, with 10 percent scoring less than the 50th percentile, 90 percent scoring between 50th and 74th percentile, and no one scoring more than the 75th percentile on the math section of the TAAS. Of the 144 math student sample, 18 students were assigned to teachers on math permits. Breakdown on the NCE math test scores revealed that 11 percent scored less than the 50th percentile, 89 percent scored between 50th percentile and 74th percentile. There were no teachers assigned to teach math with certification in another field or who were long term substitutes.

Distribution of Reading Students by Teacher Preparation

Of the total sample of reading students (n=127), 58 students were assigned to teachers with full reading certification (see Table 1). Of the 58 students, 78 percent scored less than the 50th percentile and 22 percent scored between the 50th percentile and 74th percentile on the Normal Curve Equivalence (NCE) scores for the reading section of the Texas Assessment of Academic Skills (TAAS).

A total of 23 students were assigned to teachers with alternative certification in reading, with 70 percent of those same students scoring less than the 50th percentile, 22 percent scoring between the 50th percentile and 74 percentile, and eight percent scoring higher than the 75th percentile on the NCE TAAS scores for reading. In the sample of 127 reading students, 27 students were assigned to teachers who were long-term substitutes. Breakdown on the reading test revealed that 48 percent scored less than the

50th percentile, 15 percent scored between the 50th percentile and 74th percentile, and 37 percent scored above the 75th percentile.

Eighteen students were assigned to teachers who were certified in an area other than English/language arts. Of this, 83 percent scored less than the 50th percentile and 17 percent scored between the 50th and 74th percentile. There were no teachers assigned to teach reading with a reading permit.

NCE Math Score Differences by Teacher Preparation

There were no significant differences in mean NCE math scores (see Table 2). While students taught by teachers with full certification scored a high mean NCE math score of 36 and students taught by teachers with alternative certification scored a low mean NCE score of 21, the overall differences were not significant. Within both groups, there was so much variability that standard deviations were so high that the statistical analysis using an ANOVA procedure showed no significant differences.

Table 2 about here

NCE Reading Score Differences by Teacher Preparation

Reading achievement did not appear to be positively affected by teacher certification in English/language arts. Reading NCE scores for students in a high-poverty middle school with high bilingual student enrollments were significantly higher for students taught by teachers who were long term substitutes (see Table 2). Students taught by long-term reading substitutes did better in NCE reading scores than students taught by teachers in any of the other teacher preparation categories.

Math and Reading Grade Difference by Teacher Preparation

Math and reading grades were analyzed for grade distributions in each teacher preparation category. It was believed that a similar pattern in differences by teacher preparation category for both reading and math grades would be found with NCE math and reading scores. The implication if such differences were not found was that it would provide evidence of grade inflation, a symptom of misalignment; in fact, both grades were considerably higher than NCE math and reading scores. Those students who did not do well on math and reading achievement tests were not expected to have similar grades as those students who did do well.

Math Grade Distributions

There were no statistically significant differences among students taught by teachers with full certification, alternative certification, or math permits on the end of semester grades (see Table 3). The distribution of math grades was similar for those groups in the analysis. No students taught by long-term substitute teachers or teachers certified in a field other than math were included in the groups tested. The means for math grades were the same across all students regardless of the type of certification held by the student's math teacher.

Table 3 about here

Reading Grade Distribution

The data revealed that final semester grades for students taught by teachers certified in a field other than the assigned reading field were significantly higher than final semester grades for students taught by teachers certified in reading (see Table 3). The means for reading grades

were the same across all other students regardless of the type of certification held by the student's reading teacher.

Math and Reading Grades and Grade Inflation

The findings indicated evidence of grade inflation among reading grades in end-of-the semester grades and that the degree of grade inflation was different by teacher preparation category. In math, teachers with alternative certification had the highest level of grade inflation. All other teacher preparation categories issued grades that reflected performance on NCE TAAS scores.

Teachers who were assigned to teach reading and certified in a subject area other than reading had the highest levels of grade inflation. Their students demonstrated the most discrepancy between their NCE reading scores and the final grade received at the end of the semester. Reading grades that were recorded by long-term substitutes were more reflective of the student's test performance on the NCE reading test. Students who had high NCE scores on the reading test were more likely to have higher end-of-the-semester grades; those who did not have high NCE scores were also not likely to do well in their end-of-semester grades. Moreover, students that were taught by teachers with alternative certification in reading had a higher level of grade inflation than students who were taught by teachers who were fully certified.

It would appear that teachers who are fully certified were more likely to assign grades that are more in line with the student's ability as reflected in their NCE reading scores than teachers with an alternative certification.

Differences Between At-Risk and non At-Risk Students by Teacher Preparation on Math and Reading Grades and NCE Scores

Because the data analyses on both the NCE reading and math scores and on end-of-semester grades grouped all students simply by teacher preparation, it was believed that significant differences could imply the effect of being taught by teachers with different certification preparation would be masked by having both at-risk and non at-risk students in the student samples tested. Further analyses segregated both at-risk and non at-risk students taught by teachers with different certification preparation so that differences in NCE scores would better reflect the influence of teacher preparation (see Table 6).

Table 6 about here

Distribution of Students by Risk Factor

Math Students: Of the total sample of math students (n=144), 50 percent were at risk and 49 percent were non at risk (see Table 4). Teachers with full certification taught 104 math students, 54 percent non at-risk students and 46 percent at-risk students. Teachers with alternative certification taught 21 students, 71 percent at-risk and 29 percent non at-risk. Teachers on permits taught 18 math students, 55 percent at risk and 45 percent non at risk. Proportionately, teachers with alternative certification taught more at-risk math students. While teachers with full math certification numerically taught more at-risk students (104) than math teachers with alternative certification (n=21), these teachers had a more even distribution of at-risk and non at-risk students.

Table 4 about here

Reading Students. Of the total sample of reading students (n=127), 53 percent were considered as at risk and 47 percent were non at risk (see Table 4). Teachers with full reading certification were assigned 58 reading students, 57 percent at risk and 43 percent non at risk. Long-term substitutes were assigned 27 students, 30 percent at-risk and 70 percent non at-risk. Teachers with alternative certification were assigned 23 reading students, 70 percent at-risk and 30 percent non at-risk. Teachers with certification in another subject were assigned 18 reading students, 55 percent at risk and 45 percent non at-risk. Proportionately, long-term substitutes had more non at-risk students than teachers with full reading certification and teachers in the other categories.

Math and Reading Performance of At-Risk and Non At-Risk Students

NCE Math Scores. NCE math scores were analyzed for differences among at-risk students by teacher preparation as well as among non at-risk students by teachers in the different certification categories. Analyses of variance on NCE math scores revealed that there were no statistical differences for at-risk and non at-risk students by teacher preparation. The means for NCE math scores were the same across all students regardless of the type of certification held by the student's math teacher for both at-risk and non at-risk students. While there was no statistically significant difference in math NCE scores by teacher preparation category, math teachers with permits outperformed all other teacher preparation categories in preparing at-risk students to take the TAAS. Teachers with full math certification outperformed other teacher preparation categories in preparing non at-risk students to take the TAAS.

NCE Reading Scores. At-risk students taught reading by teachers who had alternative certification scored significantly higher than students taught reading by teachers with full certification (see Table 5). Non at-risk students taught reading by long-term substitutes scored significantly higher than students taught reading by teachers certified in subject other than reading or students taught reading by teachers with full certification. Non at-risk students taught reading by a full certification reading teacher did better than other non at-risk students taught by teachers with alternative certification or certification in another subject. In general, it appears that being taught by teachers fully certified in reading/English /language art did not positively affect the reading performance for at-risk students. On the contrary, at-risk students performed better when they were taught by teachers with alternative certifications.

Table 5 about here

End-of-the Semester Math Grades. Math grades were analyzed for differences among at-risk students by teacher preparation as well as among non at-risk students by non at-risk students by teachers in the different certification categories. Analyses of variance on math grades revealed that there were no statistical differences for at-risk and non at-risk students by teacher preparation. The means for math grades were the same across all students regardless of the type of certification held by the student's math teacher for both at-risk and non at-risk students.

End-of-the-Semester Reading Grades. Reading grades were analyzed for differences among at-risk students by teacher preparation as well as

among non at-risk students by teachers in the different certification categories. Analyses of variance on reading grades revealed that there were no statistical differences for at-risk students and non at-risk students by teacher preparation. The means for reading grades were the same across all students regardless of the type of certification held by the student's reading teacher for both at-risk and non at-risk students.

Student Math and Reading Achievement Differences by Gender

Reading and math scores were analyzed for differences among males and females. An analysis of variance on NCE reading scores revealed that there were no statistical differences ($F = .0972$; $df = 145$; $p = .7556$) between males and females on NCE reading scores. Similarly, no statistical differences ($F = .4217$; $df = 145$; $p = .5171$) between females and males were found in NCE math scores. The findings would indicate that differences in reading and math scores are attributable to factors other than gender.

Conclusions

The purpose of this study was to examine teachers as a significant component in the flow of resources and their effect on student achievement using a high-poverty middle school and a randomly selected stratified sample of even numbered at-risk and non at-risk students for sixth, seventh, and eight grade. The study's goal was to examine teacher preparation, or intended use of teachers as resources to maximize achievement and teacher resource allocation, or the actual use of a resource, and student achievement (using math and reading grades and TAAS scores). "How do teachers as resources in the resource utilization

process affect achievement for at-risk students and regular students in a high-poverty middle school?"

Generally, the data show that student math achievement in a high-poverty sample school was not significantly affected by teacher preparation category. In math, there were no statistical differences in student achievement for at-risk and non at-risk students regardless of who taught the student; however, math teachers on a teaching permit did a better job of preparing at-risk students to take the TAAS. Math teachers with full certification did a better job of preparing non at-risk students to take the TAAS.

In reading, there was a statistical difference in student achievement for students taught reading by long-term substitutes. Students taught reading by long-term substitutes had statistically different NCE scores than students taught reading by teachers with full certification, teachers with certification in a subject other than reading, and teachers with alternative certification. Long-term substitute teachers did a better job of preparing non at-risk students to take the reading section of the TAAS. Reading teachers with alternative certification did a better job of preparing at-risk students to take the TAAS.

According to follow-up interviews conducted with the principal, there were three reading/English long term reading substitutes. One long-term substitute replaced a bilingual master teacher who became an assistant principal at mid-term. The second long-term substitute was hired to replace another master teacher who moved to a magnet school in the middle of the semester. The long-term substitute was strategically hired to

provide bilingual/at-risk instruction, experiential learning activities, integrated curriculum, and hands-on activities. Two long-term substitutes were hired on a temporary basis to move into permanent teaching positions in the fall. In addition, the reading long-term substitutes taught fewer at-risk students (30 percent) than did the full certification teacher. There were twelve students from the reading sample of 127 students who scored between the 75th and 99th percentile, and ten of those were assigned to long-term substitutes. While this may explain the effects of long-term substitutes, there are questions about certification and preparation.

Did teacher certification make a difference? To what degree were teacher resources properly aligned or matched between the capabilities of the resource and the actual use to maximize their potential? How did low-income, linguistically, and immigrant students affect teacher resource alignment and maximum productivity?

Generally, it would appear that what existed on this campus was a mismatch between the capabilities of the resources and the actual use. Neither full certification nor other categories of teacher preparation made a significant difference in math student achievement. In reading, students taught reading by long-term substitutes scored significantly higher mean TAAS scores than students taught reading by teachers with full reading certification. Schoolwide TAAS passing (successful completion of 70 percent of the items or more) data showed that 27 percent of the seventh and 16 percent of the eighth grade math and 55 percent of the seventh and 50 percent of the eighth grade reading/English/language arts students passed.

However, there are a number of reasons why this study cannot make any definitive conclusions on teacher certification other than to pose the need for more focused school level studies on the uses of teacher resources in high-poverty schools. As a exploratory study, the quantitative findings need to be interpreted in context of the unique environment, including conditions of student poverty, poor school funding, organizational capacity and teacher commitment, and school autonomy.

In a school where 74 percent of the students were low-income and 86 percent were academically at-risk, the effects of poverty were substantial. Poor children have little access to traditional learning materials, like books, writing materials, computers, tutoring, private lessons, after-school supports, and other benefits that come from middle class incomes. While the dreams and values of poor children may be the same as those of middle class students, their history, language, and experiences may be different (Stanfield, 1985; and Delpit, 1995.) The extent to which teacher preparation programs incorporate the linguistic, cultural, and pedagogical needs of poor children were also unknown.

The effects of language and immigrant status were complicating factors. According to the school data over 34 percent of the students were categorized as limited English proficient. Comments by the principal indicated that the reading/English/language arts program was a problem because in a school where, according to his estimates, 60 percent of the student enrollment was categorized as bilingual, the school did not use a bilingual approach or have a bilingual program. According to parent data,

over 50 percent of the students were born in or were from parents who were born in Mexico or El Salvador.

The condition of poor children in the sample middle school was compounded by poor school funding. According to the budget data gathered in a previous study, the campus was funded at a level of 28 percent less than a sample of seven non-poverty middle schools from across the state (Reyes, 1996).

Organizational capacity, which includes teachers' professional knowledge and skills, effective leadership, availability of technical and financial resources, and organizational autonomy, was a factor. In a school where 50 percent of the math and reading readings had fewer than fours years of experience, the staff did not have the trust level or the opportunity to work with each other to develop a learning community, organizational capacity and teacher commitment were assumed low.

Organizational capacity was affected by a teacher supply with little training, low levels of teacher preparation, and little experience. There were 87 teachers assigned to the sample campus, of which 55 percent were certified in the subject assigned, 11 percent certified in a subject other than the subject assigned, 10 percent with alternative certification, 5 percent with teaching permits, and 11 percent long-term substitutes. In math and reading, only 38 percent were certified in the assigned subject.

According to the data gathered, over 50 percent of the math and reading teachers had four years of experience or less. Follow-up teacher interviews indicated that teacher turnover was affected by teachers moving to higher status schools, feelings of isolation or lack of support by younger

teachers, and teacher ineffectiveness. By the end of the data gathering year, over ten teachers left the sample school. Excellent teachers moved to teach in better schools. Some teachers abandoned their contracts in the middle of the school year and others completed their contracts and did not return in the fall. One teacher was terminated for ineffectiveness.

School autonomy as measured by the school improvement plan and teacher interviews appeared to be absent. The school improvement plan was driven by one year state-and district-imposed TAAS achievement gains. The school, under a state accreditation warning, was under tremendous external pressure to improve student achievement; however, there was no evidence of long-term teacher developed goals that were unique to the needs of the students or the teachers. Younger teachers felt that they did not have a voice in decision making as the site-based decision making committee was dominated by senior teachers who where often reluctant to change. Teacher communication occurred within some teams and through grapevines. School leadership was marked by four principals in a period of five years (Reyes, 1997).

In gathering the data for this study, a number of data-related problems were encountered. There were no current databases that disaggregated teacher certification by full certification in the assigned subject, certification in a subject other than the assigned subject, certification permit, alternative certification, and long-term substitute. These data had to be gathered from the school office and the district personnel office. There were no databases that included teachers, assigned students, and achievement. Student achievement data were only available at the school

level in hard copy for one year. Campus-based longitudinal growth could not be calculated.

Missing data were another problem encountered in this study. Measures for teacher preparation and student achievement growth were flawed. This study did not collect individual teacher background data, like number of math, reading, language arts, English-as-a-second-language, Spanish, high-poverty and at-risk student methods courses or staff development activities, to support conclusions on the degree to which teacher resources were properly prepared to work with high-poverty, at-risk, bilingual students. The school level database did not keep longitudinal achievement data and student growth was not measured.

The study results indicated that the teachers' knowledge, skill level, caring, commitment to student learning, and the school's organizational capacity were incongruent with the needs of high -poverty students (Ashton, 1996; Ashton & Webb, 1986; Cohen, McLaughlin, & Talbert, 1993; Darling-Hammond & Sclan, 1996; Darling-Hammond, 1992; Levin, 1987; Little, 1982; Ladson-Billings, 1995; Lopez, 1995; Newmann, King & Rigdon, 1997: Sikula, Battery, & Guyton, 1996; and Tatto, 1996).

Finally, case studies are supposed to be hypotheses-generating, not hypothesis confirming. Case studies pick up details that macro studies miss. According to the literature review there are no school productivity studies in high-poverty schools (Bennett, 1995; Monk, 1994; Odden & Clune, 1995). This study may be picking up conditions and needs that are unique to high-poverty, high-bilingual, urban middle schools, which may be different from national samples that are largely majority students.

The findings from this study clearly indicate the need for more comprehensive micro-level studies that measure the unique characteristics, preparation, development, allocation, and actual use of teacher resources to maximize achievement in high-poverty schools. How do school administrators in high-poverty schools measure good matches between unique teacher resources and unique student needs in order to maximize teacher productivity? Particular attention needs to be given to the preparation of math and reading/English/language arts teachers assigned to work with bilingual, at-risk, and non at-risk students in high-poverty schools.

Future studies should address these important questions while providing large scale databases with a more exact understanding of how resources are allocated at the school, class, and individual student level. Only then will we have a clear understanding of how resources shape and affect the learning environment. We know money makes a difference, but that is only the beginning of the process, not the end. All schools react to resources differently.

Table 1. Distribution of Math and Reading Students by Teacher Preparation

*NCE Percentile on Math Section of TAAS	1	2	3	4	5	6	Total
<50th		2			2	17	21
(%)		(11%)			(10%)	(16%)	(15%)
50th-74th	1	16			19	73	109
(%)	(100%)	(89%)			(90%)	(70%)	(76%)
>74						14	14
(%)						(14%)	(10%)
Total	1	18			21	104	144

*NCE Percentile on Reading Section of TAAS	Teacher Preparation**						
	1	2	3	4	5	6	Total
<50th			15	13	16	45	89
(%)			(83%)	(48%)	(70%)	(78%)	(70%)
50th-74th		1	3	4	5	13	26
(%)		(100%)	(17%)	(15%)	(22%)	(22%)	(20%)
>74				10	2		12
(%)				(37%)	(8%)		(9%)
Total		1	18	27	23	58	127

*NCE=Normal Curve Equivalence
**Teacher Preparation Categories certification

1=unknown
2=permit
3=certified in subject other than the subject taught
4=long-term substitute
5=alternative certification
6=full certification in subject

Table 2. TAAS NCE Math and Reading Score Differences by Teacher Preparataion

*NCE Math

Teacher Preparation Category***	Mean Score	Standard Deviation(n)*	F Value	P	Pairs of Groups Significantly Different at .05 Level*
1	33	(n=1)	2.3063	.0793	none
2	28	(n=18)			
5	21	18(n=21)			
6	36	27(n=104)			
Total Sample	33	25(n=144)			

*NCE Reading

Teacher Preparation Category*** (Groups)	Mean Score	Standard Deviation(n)**	F Value	P	Pairs of Groups Significantly Different at .05 Level*
1	62	(n=1)	6.087	.0002	4 vs. 6*
2					4 vs. 3*
3	30	19(n=18)			4 vs. 5*
4	53	30(n=27)			
5	35	23(n=23)			
6	29	19(n=58)			
Total Sample	35	24(n=127)			

*NCE=Normal Curve Equivalence
**n=number of students
***Teacher Preparation Categories

1=unknown certification	3=certified in other subject	5=alternative certification
2=permit	4=long-term substitute	6=full certification in subject

Table 3. Final Semester Math and Reading Grade Differences by Teacher Preparation

Math Grade Differences

Teacher Preparation Category** (Groups)	Mean Score	Standard Deviation(n=)*	F Value	P	Pairs of Groups Significantly Different at .05 Level*
1	84	(n=1)	.1299	.9422	None
2	82	6(n=18			
3					
4					
5	81	7(n=21)			
6	81	8(n=104)			
Total Sample	81	8(n=144)			

Reading Grade Differences

Teacher Preparation Category**	Mean Score	Standard Deviation(n)*	F Value	P	Pairs of Groups Significantly Different at .05 Level*
1	86	(n=1)	2.5955	.0397	3 vs. 6
2					
3	87	7.6(n=18)			
4	81	7.9(n=27)			
5	81	5.5(n-23)			
6	80	8.3(n=58)			
Total Sample	81	7.9(n=127)			

*n=number of students

**Teacher Preparation Categories

1=unknown certification
2=permit
3=certified in subject other than the subject taught
4=long-term substitute
5=alternative certification
6=full certification in subject

Table 4. Student Assignment by Teacher Preparation Category of At-risk and Non At-risk Students

Math	Teacher Preparation*					
	1	2	3	4	5	6	Total
At Risk		10 (55%)			15 (71%)	48 (46%)	73 (50%)
Non At Risk	1	8 (45%)			6 (29%)	56 (54%)	71 (49%)
Total	1	18			21	104	144

Reading							
	1	2	3	4	5	6	Total
At risk			10 (55%)	8 (30%)	16 (70%)	33 (57%)	67 (53%)
Non At Risk	1		8 (45%)	19 (70%)	7 (30%)	25 (43%)	60 (47%)
Total	1		18	27	23	58	127

*Teacher Preparation Categories

1=unknown certification
2=permit
3=certified in a subject other than the subject taught
4=long-term substitute
5=alternative certification
6=full certification in subject taught

Table 5. Math NCE Score Differences of At-Risk and Non At-Risk Students by Teacher Preparation

*NCE Math Scores for At Risk

Teacher Preparation Category*** (Groups)	Mean Score	Standard Deviation(n**)	F Value	P	Pairs of Groups Significantly Different at .05 Level*
1			.6693	.5153	none
2	25	14(10)			
3					
4					
5	18	13(15)			
6	21	18(48)			
Total Sample	21	16(73)			

*NCE Math Scores for Non At Risk

Teacher Preparation Category (Groups)***	Mean Score	Standard Deviation(n**)	F Value	P	Pairs of Groups Significantly Different at .05 Level**
1	33	23(1)	1.899	.1383	none
2	31	278)			
3					
4					
5	29	27(6)			
6	49	27(56)			
Total Sample					

* Normal Curve Equivalence
**n=number of students
***Teacher Preparation Categories
1=unknown certification
2=permit
3=certified in subject other than the subject taught
4=long-term substitute
5=alternative certification
6=full certification in subject

Table 6. Reading NCE Score Differences of At-Risk and Non At-Risk Students by Teacher Preparation

*NCE Reading Scores for At Risk

Teacher Preparation Category*** (Groups)	Mean Score	Standard Deviation(n)**	F Value	P	Pairs of Groups Significantly Different at .05 Level*
1			3.071	.0383	5 vs. 6*
2					
3	32	17(n=10)			
4	30	15(n=8)			
5	34	24(n=16)			
6	20	14(n=33)			
Total Sample	26	18(n=67)			

*NCE Reading Scores for Non At Risk

Teacher Preparation Category*** (Groups)	Mean Score	Standard Deviation(n)**	F Value	P	Pairs of Groups Significantly Different at .05 Level**
1	62	(n=1)	4.7591	.0023	4 vs. 3**
2					4 vs. 6**
3	25	29(n=8)			
4	62	29(n=19)			
5	35	23(n=7)			
6	39	17(n=26)			
Total Sample	45	25(n=60)			

* Normal Curve Equivalence
**n=number of students
***Teacher Preparation Categories
1=unknown certification
2=permit
3=certified in subject other than the subject taught
4=long-term substitute
5=alternative certification
6=full certification in subject

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